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DURUM WHEAT



QUALITY REPORT

Physical, Chemical, Milling, and Macaroni Characteristics

1976 CROP

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
NORTH CENTRAL REGION

and
NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF CEREAL CHEMISTRY & TECHNOLOGY

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
in cooperation with
STATE AGRICULTURAL EXPERIMENT STATIONS

QUALITY EVALUATION OF DURUM WHEAT VARIETIES

1976 CROP^{1/}

by

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1/ This is a progress report of cooperative investigations containing some results that have not been sufficiently confirmed to justify general release; interpretations may be modified with additional experimentation. Confirmed results will be published through established channels. The report is primarily a tool for use of cooperators and their official staffs and to those persons having direct and special interest in the development of agricultural research programs.

This report was compiled by the Agricultural Research Service, U.S. Department of Agriculture. Special acknowledgment is made to the North Dakota State University for their facilities and services provided in support of these studies. The report is not intended for publication and should not be referred to in literature citations or quoted in publicity or advertising. Use of the data may be granted for certain purposes upon written request to the agency or agencies involved.

Hard Red Spring and Durum Wheat Quality Laboratory
Fargo, North Dakota

COOPERATING AGENCIES, STATIONS, AND PERSONNEL

The cooperating agencies, stations, and personnel conducting the varietal plot and nursery experiments concerned with these durum tests in 1976 were as follows:

California Agricultural Experiment Station:

Delta and El Centro: W. F. Lehman, Y. P. Puri,
and C. O. Qualset

Minnesota Agricultural Experiment Station:

Crookston and Morris: R. E. Heiner*, L. S. Smith,
and D. D. Warnes

Montana Agricultural Experiment Station:

Havre and Sidney: F. H. McNeal*, M. A. Berg*,
R. T. Harada, and G. P. Hartman

North Dakota Agricultural Experiment Station:

Carrington, Dickinson, and Williston: T. J. Conlon,
E. French, L. Joppa*, R. Nowatzki, H. Olson, and
J. Quick

South Dakota Agricultural Experiment Station:

Selby and Watertown: J. J. Bonneman, G. Bucheneau,
and W. D. Stegmeier

Washington Agricultural Experiment Station:

Pullman and Royal Slope: C. F. Konzak, M. A. Davis,
and E. Donaldson

* ARS Employees

INTRODUCTION

The fourteenth Durum Wheat Quality Report contains data for the 1976 crop. Samples of standard varieties and new strains of durum wheat grown in cooperative experiments in the durum wheat region of the United States^{2/} were milled and evaluated by the Hard Red Spring and Durum Wheat Quality Laboratory in cooperation with the Department of Cereal Chemistry and Technology on the campus of North Dakota State University at Fargo, North Dakota. The evaluation of some of the durum wheats is integrated with the work done by the Department of Cereal Chemistry and Technology of North Dakota State University. Methods and techniques are described in detail in the text of the report.

Where sufficient quantity of sample was available for macro processing, the semolina was processed into spaghetti to determine the quality characteristics. When the quantity of semolina was insufficient (micro quantity), only the color of the semolina (Gardner^{3/} color score) was determined.

The purpose of this report is to make available to cooperators the quality data on standard varieties and new strains of durum wheat from the 1976 crop.

^{2/} Heiner, R. E., Elsayed, F. A., and Quick, J. S. Wheat varieties grown in cooperative plot and nursery experiments in the spring wheat region in 1976. Agricultural Research Service, U.S. Department of Agriculture.

^{3/} Mention of a trademark name or proprietary product does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture, and does not imply its approval to the exclusion of other products that may also be suitable.

SOURCE OF THE 1976 CROP SAMPLES

Five hundred and twenty-eight durum samples were received from 9 stations in 6 states--California, Minnesota, Montana, North Dakota, South Dakota, and Washington--for quality evaluation as follows:

Uniform Nursery (275 samples): Morris, MN; Havre and Sidney, MT; Carrington, Dickinson, and Williston, ND; and Selby, SD. The varieties and selections included in this nursery are listed on page 5. In addition, different uniform nurseries were received from Royal Slope, WA and Tulalake, CA.

Advanced Nursery (163 samples): Sidney, MT; Tulalake, CA; and Royal Slope, WA.

Field Plots (72 samples): El Centro, CA; and Dickinson and Williston, ND.

International Nursery (11 samples): Royal Slope, WA.

1976 CROP UNIFORM REGIONAL DURUM NURSERY

Entry No.	Entry	CI or Sel. No.	Year Entered	Origin
1	MINDUM	5296	1929	Minnesota
2	WELLS	13333	1957	ND-USDA
3	ROLETTE	15326	1968	"
4	WARD	15892	1969	"
5	WAKOOMA	DT316	1968	Saskatchewan
6	CROSBY	17282	1970	ND-USDA
7	BOTNO	17283	"	"
8	RUGBY	17284	"	"
9	CANDO	17438**	1972	North Dakota
10	Lds//61130/Lds	D7047**	1973	" "
11	Ward/6714	D71117	"	" "
12	DT188/DT224//DT182	DT411	1974	Manitoba
13	6530/65114	D7175	"	North Dakota
14	6580/Ward	D71111	"	" "
15	6515/Ward	D71101	1975	" "
16	"	D7233	"	" "
17	6633/6647	D7266**	"	" "
18	68112/Ward	D72114*	"	" "
19	Rlt/Lds	D7275	"	" "
20	6515/Ward	D71104	1976	" "
21	6530/6654	D7224**	"	" "
22	6710/6780	D7270**	"	" "
23	6676/6750	D7298*	"	" "
24 ^{1/}	Hc/DT310	DT354	"	Saskatchewan
25 ^{1/}	7175/Ward	D74107	"	North Dakota
26 ^{1/}	"	D74110	"	" "
27 ^{1/}	"	D74111	"	" "
28 ^{1/}	"	D74112	"	" "
29 ^{1/}	"	D74114	"	" "
30 ^{1/}	"	D74116	"	" "

** Semidwarfs

* Medium height

1/ Grown only at ND stations

METHODS

The methods used in the testing of the samples were essentially the same as given in the last report, with the addition of some new tests and interpretations of the tests, as well as deletions.

Briefly, the following methods and terminologies were applied:

Test Weight Per Bushel (TW) - The weight per Winchester bushel of dockage-free wheat.

Thousand Kernel Weight (KW) - The 1000 kernel weight was determined by counting the number of kernels in a 10 g sample of cleaned, picked wheat on an Asco seed counter.

Kernel Size (LG, MD, SM) - The percentage of the size of the kernels [large (LG), medium (MD), and small (SM)] was determined on a wheat sizer as described by Shuey^{4/}.

The sieves of the sizer were clothed as follows:

Top Sieve	- Tyler # 7 with 2.92 mm opening
Middle Sieve	- Tyler # 9 with 2.24 mm opening
Bottom Sieve	- Tyler #12 with 1.65 mm opening

Protein Content (PR) - The protein (14% m.b.) was calculated by multiplying the percent nitrogen, as determined by the standard Kjeldahl procedure, by the factor of 5.7.

Milling - The samples were cleaned by passing the wheat over an Emerson kicker and dockage tester and through a modified Forster scourer Model 6. The clean, dry samples were pretempered to 12.5% for at least 72 hours prior to any additional tempering before milling.

The field plot and large advanced yield nursery samples were milled on a Buhler experimental mill specially designed for milling durum wheat. The mill is equipped with corrugated rolls throughout and the semolina purified on a Miag laboratory purifier. All of the stock is handled pneumatically. The mill flow is shown on page 7. The clean, dry wheat was tempered in three stages: first to 12.5% moisture at least 72 hours prior to the second stage which is to add an additional 2.0% for 18 hours to give a cumulative moisture of 14.5%, then a final temper of 3.0%, 45 minutes prior to milling. The purified semolina is used in testing the quality of semolina. The semolina extraction was calculated on a total products basis.

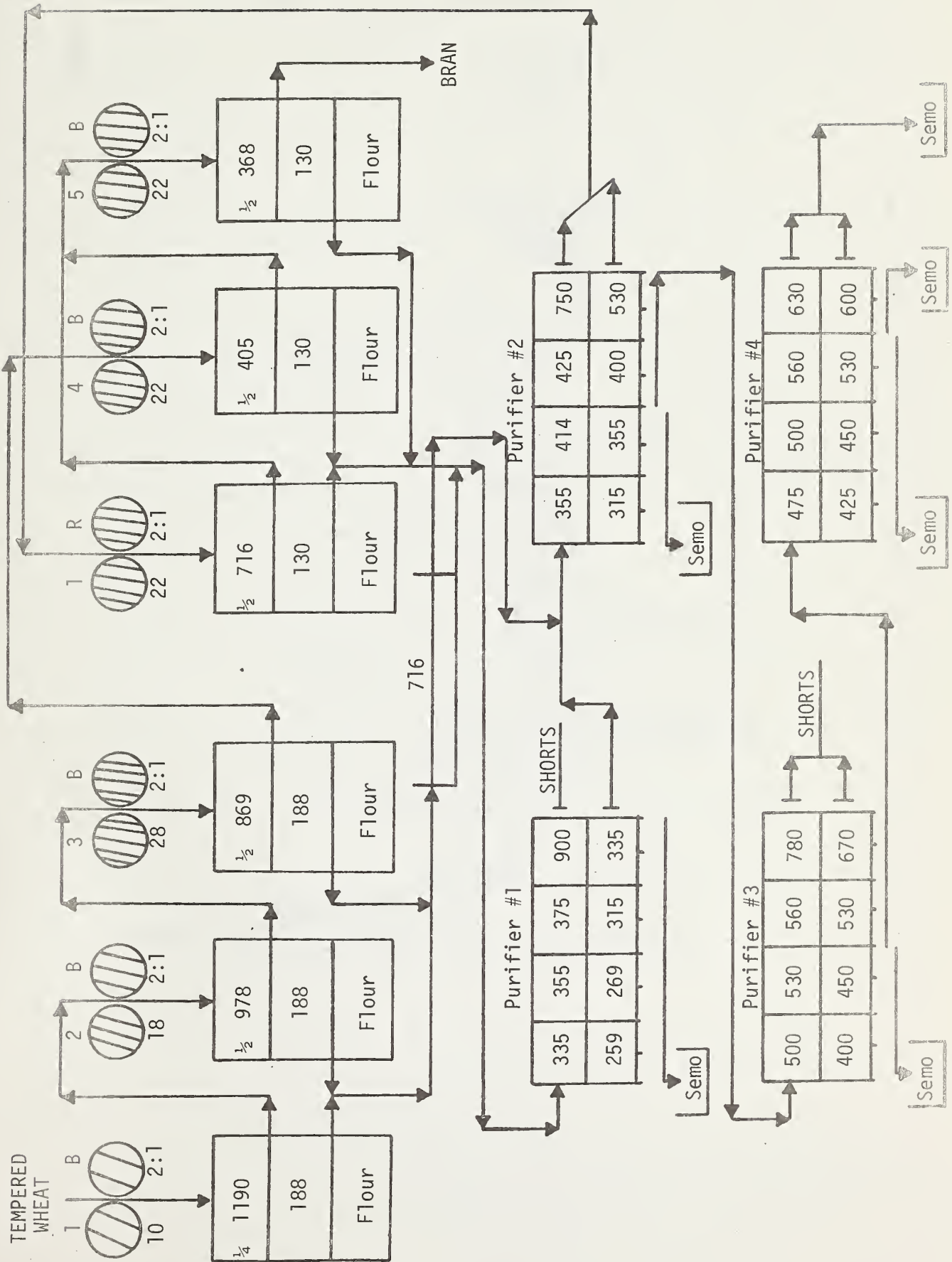
The small samples were milled according to the method of Vasiljevic et al. ^{5/}. The flow diagram of this system is shown on page 8. Extraction is determined on a clean, dry basis.

^{4/} Shuey, William C. A wheat sizing technique for predicting flour milling yield. Cereal Sci. Today 5: 71 (1960).

^{5/} Vasiljevic, S., Banasik, O. J., and Shuey, W. C. A micro unit for producing durum semolina. Cereal Chem. 54: 397 (1977).

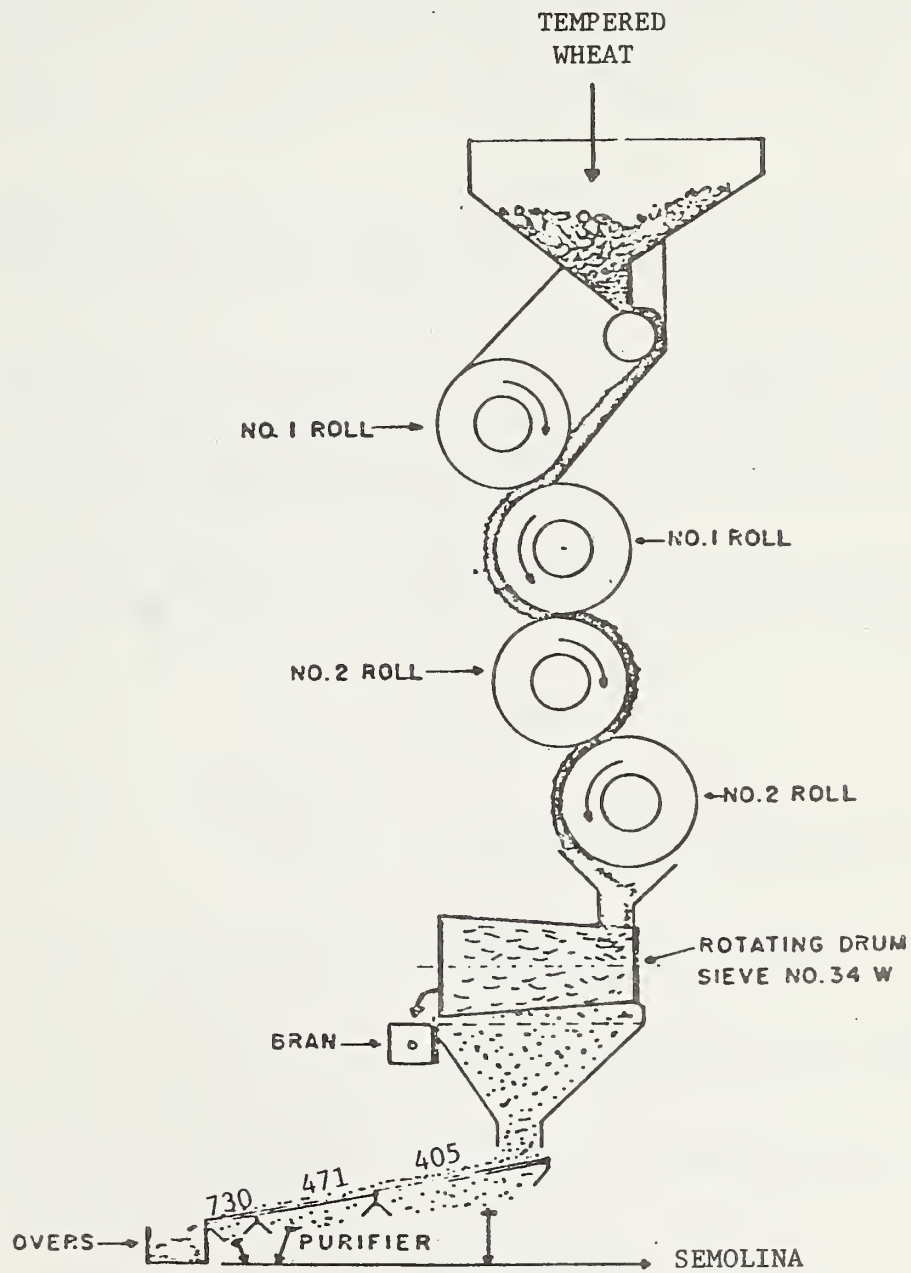
FLOW DIAGRAM FOR LARGE DURUM WHEAT SAMPLES

- 7 -





FLOW DIAGRAM FOR SMALL DURUM WHEAT SAMPLES



Semolina Extraction (SEEX) - The percent semolina calculated on a total products basis.

Speck Count (SP) - The number of specks in three different one-inch square areas of semolina enclosed by a special glass and frame were counted. Any materials other than pure endosperm chunks, such as bran particles, etc. were considered specks. The average of three readings was converted to the number of specks per 10 sq in (speck count).

Color Score - The color of the spaghetti or semolina has been generally accepted as the most important single grading factor. A deep amber or golden color is the most preferable. The amount of yellow pigmentation determines the extent or degree of amberiness.

Samples which have a color rating 1.5 points below the standard spaghetti score or 9 points below the standard semolina color score are unsatisfactory. It is possible that the average color score for a crop year may be higher or lower than average; therefore, this would be taken into consideration when giving the overall rating of a variety over a number of years.

The grading system shown below has been adopted for scoring the color of semolina and spaghetti relative to the standard color score.

COLOR SCORE

<u>Semolina</u>	<u>Spaghetti</u>	<u>Description</u>
9 above	1.5 above	Much deeper and intense yellow pigmentation than standard
6 above	1.0 above	Deeper and more intense yellow pigmentation than standard
3 above	0.5 above	Slightly deeper and more intense yellow pigmentation than standard
Equal to Standard	Equal to Standard	Standard quality, depth and intensity of yellow pigmentation
3 below	0.5 below	Slightly less depth and intensity, but sufficient quantity of pigmentation
6 below	1.0 below	Slightly less quantity as well as depth and intensity of pigmentation than the standard, but still sufficient to be rated satisfactory on the basis of color
9 below	1.5 below	Sufficiently less quantity of yellow pigmentation than the standard to give a pale yellow color and graded unsatisfactory for color score.

Semolina Color Score (DU) - The semolina color score was determined by using Model XL-10 Gardner digital color difference meter. The instrument was calibrated using a yellow standard tile (L = 82.5, a = -3.6, and b = +25.2). A sample of semolina (3/4-inch deep) is placed in a sample cup for an Agtron reflectance color meter. After the first reading has been taken, the sample is turned 90 degrees and a second reading is taken and the two readings averaged. The "b" color value is converted to a color score ranging from 1 to 14, with 14 being a deep yellow and the most desirable color. In this report, the semolina color score, reported as "DU" in the tables, is multiplied by a factor of 10.

Spaghetti Color (VI) - The spaghetti color scores were determined on a Model D25 Hunter color difference meter equipped with a D25A optical unit. The specimen area (2 in diameter) was covered with straight spaghetti strands and readings were taken against a black background with 0% reflectance. Color difference values (L%, a%, and b%) were measured for all the spaghetti samples by the method of Walsh, Gilles, and Shuey^{6/}. A uniform chromaticity chart was used for determining spaghetti color scores.

MACRO Spaghetti Processing - Spaghetti was processed on a semi-commercial scale pasta extruder (DEMACO). The control as well as sprouted durum was processed with the following extruding conditions.

Temperature 49.5°C

Rate. 12 rpm

Absorption. 31.5%

Vacuum. 18 in Hg

These were the optimum conditions for processing spaghetti, which were calculated by a linear programming technique.

To process the pasta, 1000 g batch^{7/} was premixed by slowly adding the water and mixing at a slow speed for approximately 30 seconds, and high speed for 10 seconds, then add the remainder of the water at slow speed in a Hobart C-100-T mixer equipped with a pastry knife agitator. After all of the water has been added, the semolina and water are blended at high speed for 30 seconds; the mixer was stopped to scrape down the sides of the bowl and the blending continued for 90 seconds more to complete the premix stage. The

6/ Walsh, D. E., Gilles, K. A., and Shuey, W. C. Color determination of spaghetti by the tristimulus method. Cereal Chem. 46: 7 (1969).

7/ Weight was determined as follows:

where:

$$\left[\frac{100-m_1}{100-m_2} - 1 \right] (W - W (m_2-m_1)) = \text{Amount } H_2O \text{ added}$$

m_1 = original moisture

m_2 = desired moisture

W = desired amount of sample

premixed pasta was then transferred to the vacuum mixer of the press and extruded through an 84-strand 0.043 in teflon spaghetti die. A jacketed extension tube (9½" long x 1-3/4" inside diameter) was attached to the semicommercial pasta extruder to allow more time for hydration of the semolina and minimize the number of white specks (unhydrated semolina) in the spaghetti. Extrusion temperature was controlled by a circulating water bath.

MICRO Spaghetti Processing - Thirty grams of semolina were mixed with water to form a stiff dough, pressed into spaghetti and dried. The equipment and procedure have been described by Harris and Sibbitt^{8/} and Fifield^{9/}.

Spaghetti Drying - Spaghetti was dried in an experimental pasta dryer for an 18 hour cycle as described by Gilles, Sibbitt, and Shuey^{10/}. During the drying period, the humidity of the dryer was decreased linearly from 95 to 60% R.H. and the temperature was held constant at 100°C.

Cooking Characteristics of Spaghetti -

a. Cooking Procedure

A modification of the method of Sheu et al.^{11/} was adopted to determine cooking quality of spaghetti used in this study. Spaghetti (10 g) which had been broken into lengths of approximately 5 cm, was placed into 300 ml of boiling 1% NaCl salt solution in a 500 ml beaker. After 10 minutes cooking, the samples were washed thoroughly with distilled water in a Buchner funnel, allowed to drain for 2 minutes, and then weighed to determine cooked weight.

b. Firmness Score (FR)

Two strands of cooked spaghetti were placed on a plexiglass plate and sheared at a 90° angle with a special plexiglass tooth. A continuous recording of distance versus force was made by the instrument during the operation. An automatic integrater was used to calculate the area under the curve (g cm) which was the amount of work required to

^{8/} Harris, R. H., and Sibbitt, L. D. Experimental durum milling and processing equipment with further quality studies on North Dakota durum wheats. Cereal Chem. 19: 388 (1942).

^{9/} Fifield, C. C. Experimental equipment for manufacture of alimentary pastes. Cereal Chem. 11: 330 (1934).

^{10/} Gilles, K. A., Sibbitt, L. D., and Shuey, W. C. Automatic laboratory dryer for macaroni products. Cereal Sci. Today 11: 322 (1966).

^{11/} Sheu, Ruey-yi, Medcalf, D. G., Gilles, K. A., and Sibbitt, L. D. Effect of biochemical constituents on macaroni quality. I. Differences between hard red spring and durum wheats. J. Sci. Fd. Agr. 18: 237 (1967).

shear the cooked spaghetti. To measure firmness, the average of three integrator scores was used, and the average work to shear was used as a measure of spaghetti firmness. The firmness score was read directly from the integrator value.

The higher the value, the firmer the spaghetti. A value of approximately 8.75 appears to be of preference.

Calculations were as follows:

$$E = 0.0216 \times A \text{ (g cm)}$$

A = Average integrator reading

E = Area of curve in g cm

c. Residue (RE) -

The solids remaining after the combined cooking and washing water was evaporated.

DISCUSSION

The following discussion represents some of the basic techniques and criteria used in the milling and cooking quality evaluation of durum wheat samples. Several testing factors are used to determine the overall quality characteristics or final evaluation of a particular sample including in general the kernel characteristics, milling performance, and cooking performance.

Each evaluation factor can be important. A sample could be of a sufficiently poor quality for a given factor to eliminate it from possible future testing. However, a sample submitted for the first time and found to show little promise should be tested again to establish if it has some or good promise, or no promise. A sample which is consistently rated as little promise or no promise should be discarded.

A computer program for evaluating the milling and cooking quality of the durum samples was developed^{12/}. The program was used for evaluating all samples.

Eleven independent variables were selectively incorporated into weighted rating equations. These variables were test weight, kernel weight, percent large, medium and small kernels, semolina extraction, spaghetti and semolina color, visual color, spaghetti firmness and cooking residue. Each of the 11 variables was rated by arbitrary faulting limits compared with a percentage deviation from the standard(s) as major, minor, probable or no fault. For each of the 11 variables, absolute limits were established to give a final evaluation of 1 = "no promise"; 2 = "little promise", 3 = "some promise"; and 4 = "good promise". Some of these ratings automatically translate into an evaluation of 1 because of the absolute limits established.

Because of the large number of durum samples received in recent years and the small size of some of the samples, it has become prohibitive to perform all the evaluation tests on each sample. Such limitations prompted the formulation of 12 separate weighting equations each representing a different combination of variables for the final evaluation of the sample. By utilizing these 12 equations, anywhere from 7 to 11 variables in various combinations can be evaluated.

All samples, as in previous years, are compared to a composite standard that represents a blend of the crop year blended to a known quality. However, the samples for the individual stations are evaluated against the average results of the check varieties from the respective stations.

^{12/} Dick, J. W., and Shuey, W. C. A computerized method for evaluating durum wheat quality. Cereal Chem. 53: 910 (1976).

The Final Evaluation (VAL) rating applies only to the data contained in the year of the report. The main defects and outstanding features are discussed. A selection which is promising as a new variety should be continued. A sample which shows little or no promise should be discontinued.

EXPERIMENTAL RESULTS

The results are tabulated and presented in the following order: Tables 1-5, Advanced Nursery Samples; Tables 6-8, Field Plot Nursery Samples; Table 9, International Nursery Samples; and Tables 10-12, Uniform Regional Nursery Samples.

A study involving over 400 samples from two crop years has indicated that the semolina color score (DU) can reasonably predict the spaghetti color score within a half a point which is within the range of duplication. A correlation coefficient of 0.8 was found between the semolina color score and the spaghetti color score.

The lipoxidase activity of the present varieties and selections is sufficiently low and does not adversely affect the color when processing semolina into spaghetti.

ADVANCED NURSERY SAMPLES

Sidney, Montana (Table 1). The 4 entries (Crosby, Rolette, Ward, and Wells) were grown on dryland and under irrigation. Generally, the dryland samples were of better quality than the irrigated. Wells on dryland and Rolette and Ward had major quality deficiencies. Wells (dryland) had small kernels and Rolette and Ward (irrigated) had poor color.

Royal Slope, Washington (Table 2). Compared to the Standard Blend, the following entries showed no or little promise: Wandell-2, MP-14-D, E 7124041, E 7124142 S.4, T 7400030, T 7500023, T 7500239, T 7500330, T 7500385, and T 7500392. Generally, these entries were deficient in kernel size and, in some cases, semolina color.

Tulelake, California (Table 3). Compared to Leeds and Modoc, entries in this nursery that showed no or little promise were 263, 299, 309, 310, 289, 308, and 313. These entries were faulted primarily for small kernels and poor semolina color.

Tulelake, California (Table 4). Compared to Leeds and Modoc, entries in this nursery that showed no or little promise were Sentry, 517, 519, 520, 521, 534, 514, 515, 518, 522, 526, 527, and 528. Generally, these entries were faulted on test weight, small kernels, and some on milling and semolina color.

Tulelake, California (Table 5). The following entries in this nursery showed no or little promise: 2, 3, 16, 21, 27, 48, 49, 52, 9, 10, 13, 24, 25, 33, and 36. Kernel size and color were generally the deficiencies of these entries.

FIELD PLOT NURSERY SAMPLES

Williston, North Dakota (Table 6). Compared to the Standard Blend, the only entries showing any promise were D 7275 and D 72114. The major deficiencies of the other entries were kernel weight, kernel size and residue.

Dickinson, North Dakota (Table 7). Compared to the Standard Blend, entries other than the named varieties showing no or little promise were D 7047, D 71101, D 74111, D 74116 and DT 411. Most entries were faulted for low kernel weight, small kernels and cooking residue.

El Centro, California (Table 8). Compared to the standards (Leeds, Mexicali 75 and Modoc), the following entries show no promise: Concorit 71, Crane "S", Jori 69, Produra, 66049, 68044-27D, 68050, 69482, 69483-11D, and 69487.

INTERNATIONAL NURSERY SAMPLES

Royal Slope, Washington (Table 9). Compared to the Standard Blend, only two entries, Ward and Mexicali "S" CM showed any promise. The primary fault of the other entries was color and to a lesser extent spaghetti firmness.

PRELIMINARY NURSERY SAMPLES

No Preliminary Nursery samples were submitted for evaluation in 1976.

UNIFORM NURSERY SAMPLES

Minnesota, Montana, North Dakota, and South Dakota Blend (Table 10). An equal amount from each of the entries grown in the Uniform Durum Nursery at the following locations were blended before milling: Morris, MN; Havre and Sidney, MT; Carrington, Dickinson, and Williston, ND; and Selby, SD.

Entries showing no or little promise were Wells, D 7270, D 7275, D 7298, D 74114, D 74116, DT 354, and DT 411. Deficiencies of these entries generally were kernel size, milling, and spaghetti firmness.

Royal Slope, Washington (Table 11). Generally, all entries in this nursery showed some or good promise compared to the standards of Cando, Modoc, and Wandell. Wandell had small kernels.

Tulelake, California (Table 12). The four varieties Cando, Mexicali-75, Modoc, and Wandell were used as the standards for comparison. Compared to these four varieties, only five entries showed no or little promise. They were Concorit-71, Crane-B, Produra, WA6291 1419, and ID 000086 1405. All other entries showed some or good promise.

Table 1

DURUM QUALITY EVALUATION

1976 CROP

VARIETY	STATE=MONTANA STATION=SIDNEY NURSERY=ADVANCED													DEFICIENCIES ^{3/}												
	<u>1/</u> TW #/Bu	<u>1/</u> KW g	LG	MD	SM	PR	SEEX	SP	DU	VI	FR	RE	VAL ^{2/}	TW	KW	LG	SM	PR	MG	SP	DU	VI	FR	RE	SD ^{4/}	
STD-BLEND	61.3	40.3	35	61	4	13.6	53.9	30	135	9.0	7.10	4.0	3						MN					PB	PB	YS
DRYLAND																										
CROSBY	61.3	36.8	15	81	4	13.4	55.5	37	140	9.0	6.48	8.1	3		MN	MJ					MJ					MJ
ROLETTE	62.8	41.0	22	76	2	14.0	54.5	20	135	9.5	6.50	6.0	3			MN					MN					MN
WARD	61.1	38.8	31	66	3	14.0	54.4	20	135	9.0	7.00	9.1	3		PB						PB					MJ
WELLS	61.6	35.5	13	81	6	13.7	53.5	20	135	9.0	7.39	2.0	1		MN	MJ	PB									PB
IRRIGATED																										
CROSBY	62.6	45.8	50	47	3	12.9	55.1	33	130	9.0	6.72	4.4	3						MN		PB					MN
ROLETTE	62.8	47.6	56	42	2	14.2	54.4	37	120	8.5	7.54	4.0	1						MJ		MJ	PB				PB
WARD	62.4	20.5	62	35	3	12.9	55.0	33	125	9.0	7.91	3.3	1			MJ			MN		MJ					PB
WELLS	62.9	41.2	48	48	4	12.5	52.9	40	125	8.5	7.56	4.8	3						MJ		MJ	PB				MN

1/ TW = Test Weight; KW = 1000-Kernel weight; LG = Large kernels; MD = Medium kernels; SM = Small kernels;
 PR = Wheat protein (14% m.b.); SEEX = Semolina extraction; SP = Number of specks in semolina per 64.5
 sq cm; DU = Semolina color; VI = Spaghetti color; FR = Cooked spaghetti firmness in g cm; RE = Cooked
 spaghetti residue; MG = Milling deficiency based on percent semolina extraction.

2/ VAL = Final evaluation; 1 = No promise; 2 = Little promise; 3 = Some promise; 4 = Good promise.

3/ PB = Probable; MN = Minor; MF = Major.

4/ SD = Standard; YS indicates standard.

Table 2

CURUM QUALITY EVALUATION^{A/} 1976 CROP

STATE=WASHINGTON STATION=ROYAL_SLOPE NURSERY=ADVANCED																										
VARIETY	--TW_	--KW_	LG	MD	SM	--PR_	SEEX	SP	DU	--VI_	--FR_	RE_	VAL	--TW_	--KW_	LG	SM	--PR_	MG	SP	--DU_	--VI_	--FR_	RE_	SD	
STD BLEND-76 WANDELL-2 71160015 72160037 T 7500009	61.3	40.3	35	61	4	13.6	70.6		110	8.5	6.97	5.2	3													
	61.5	33.6	6	85	9	11.5	70.3		100	8.5	5.23	8.3	1													
	62.5	51.3	61	37	2	12.1	71.3		115	8.5	6.96	8.2	3		MJ	MJ	MN									
	63.0	48.5	57	41	2	12.3	71.3		115	8.5	7.34	8.4	3													
	62.0	41.3	35	64	1	10.9	70.9		100	8.5	5.66	7.6	3													
T 7500012 T 7500017 T 7500026 T 7500041 T 7500049	60.5	42.9	47	51	2	11.6	71.4		100	8.5	5.70	4.8	3													
	61.0	41.7	45	52	3	11.7	71.3		105	8.5	6.78	7.8	3													
	61.0	43.5	53	46	1	11.7	71.3		100	8.5	6.59	8.5	3													
	63.0	47.6	67	32	1	12.0	70.7		105	8.5	7.19	6.5	3													
	62.0	41.5	33	64	3	11.8	69.5		105	8.5	5.70	8.2	3													
T 7500052 T 7500067 T 7500072 T 7500202 T 7500447	60.5	44.1	40	57	3	10.8	69.9		100	9.0	6.61	7.7	3													
	60.5	45.8	52	47	1	11.7	69.3		110	9.0	4.67	7.8	3													
	61.0	47.8	61	38	1	11.9	72.0		110	8.5	7.58	6.1	4													
	63.5	46.9	61	38	1	13.5	73.1		115	8.0	7.73	4.3	4													
	62.0	43.3	37	60	3	12.6	70.9		115	9.5	5.51	4.8	3													
STD BLEND-76 MP-14-D 71150199 71150207 71150210	61.3	40.3	35	61	4	13.6	70.6		110				4													
	63.5	46.1	63	36	1	12.4	70.9		100				2													
	60.0	50.3	47	48	5	12.0	70.3		105				3													
	60.0	48.8	39	56	5	12.0	70.3		110				4													
	60.0	47.1	45	50	5	11.6	72.0		105				3													
71160054 71160106 72160050 72160058 7400050	61.0	48.5	65	33	2	12.4	70.9		105				3													
	62.0	46.5	30	65	5	11.7	69.7		105				3													
	61.5	45.0	39	58	3	12.3	70.0		115				4													
	61.0	50.8	59	38	3	11.9	70.0		110				4													
	61.5	44.2	48	49	3	12.0	71.3		110				4													
E 7124041 E 7124074 E 7124122 E 7124134 E 7124141 S.2	62.0	42.7	46	51	3	12.3	72.0		100				2													
	62.5	42.0	34	63	3	12.1	70.7		110				4													
	63.5	44.8	52	47	1	12.3	73.3		115				4													
	63.5	42.9	41	58	1	12.0	71.4		115				4													
	62.0	36.4	16	81	3	12.1	69.7		115				3													
E 7124141 S.3 E 7124141 S.6 E 7124142 S.4 E 7124142 S.6 E 7124154	62.0	36.5	17	80	3	11.3	70.9		115				3													
	64.0	39.2	23	74	3	11.2	72.0		120				4													
	62.0	36.0	13	82	5	11.5	70.9		120				1													
	62.5	41.7	31	66	3	12.5	71.4		115				4													
	62.0	44.6	41	57	2	12.4	71.4		110				4													

^{A/} See Table 1 for explanation of abbreviations and symbols.

(CONT'D)

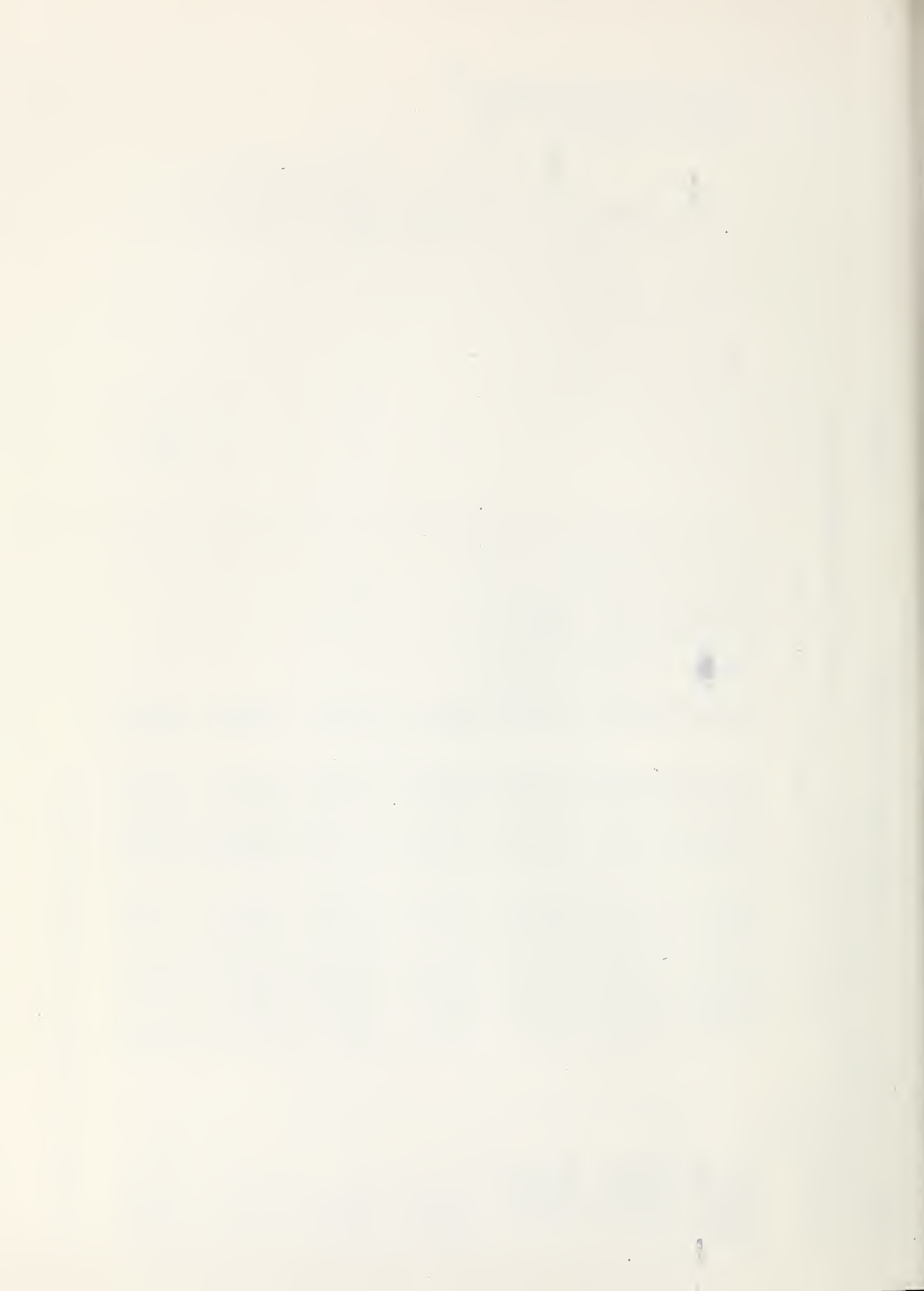


Table 2 (CONT'D)

DURUM QUALITY EVALUATION^{A/}

1976 CROP

STATE=WASHINGTON STATION=ROYAL_SLOPE NURSERY=ADVANCED																									
VARIETY	_TW_	_KW_	LG	MD	SM	_PR_	SEEX	SP	DU	_VI_	_FR_	RE_	VAL	_TW_	_KW_	_LG_	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE_	_SD_
T 7400030	62.0	41.0	31	66	3	12.3	73.1		115				1		MN	MJ	PB								
T 7500016	62.0	44.1	45	52	3	11.0	72.0		105				4			MN	PB								
T 7500023	60.5	41.5	33	64	3	11.9	72.0		95				1	PB	PB	MJ	PB							MN	
T 7500056	61.0	49.0	68	30	2	12.4	70.0		95				3	PB										MN	
T 7500066	62.0	46.9	55	43	2	11.9	71.3		110				4												
T 7500073	60.0	43.5	43	54	3	12.6	68.7		115				3	PB		MJ	PB								
T 7500086	63.5	43.7	48	51	1	12.9	68.7		110				4			MN									
T 7500095	62.5	45.5	43	55	2	12.9	70.7		110				3			MJ									
T 7500099	62.5	42.2	41	58	1	13.3	70.0		115				3		PB	MJ									
T 7500115	61.0	44.1	51	46	3	13.4	70.0		105				4	PB		PB	PB								
T 7500118	62.5	42.2	41	57	2	13.0	69.1		110				3		PB	MJ									
T 7500122	62.5	44.1	41	58	1	13.1	71.4		105				3			MJ									
T 7500125	63.0	46.5	59	40	1	12.3	71.3		105				4												
T 7500126	63.0	42.9	50	49	1	13.1	70.5		110				4			PB	PB								
T 7500127	63.0	42.9	49	50	1	13.2	70.9		115				4			PB	MN								
T 7500128	61.0	46.5	69	30	1	12.9	70.3		100				4	PB											
T 7500129	63.0	44.4	45	53	2	11.6	70.9		100				4				MN								
T 7500135	63.0	46.7	56	43	1	12.3	71.4		105				4												
T 7500139	63.0	46.5	60	39	1	13.1	69.3		110				4												
T 7500143	62.0	45.8	54	45	1	12.8	72.0		105				4												
T 7500165	62.5	45.2	51	48	1	13.2	72.6		110				4				PB								
T 7500176	62.5	45.7	49	50	1	11.8	71.4		105				4				MN								
T 7500209	63.5	43.7	51	48	1	12.9	70.9		120				4				PB								
T 7500234	63.0	44.6	49	50	1	13.1	70.9		110				4				MN								
T 7500259	60.5	40.7	34	63	3	12.0	70.3		115				1	PB	MN	MJ	PB								
T 7500263	62.5	45.7	61	38	1	13.4	68.6		105				4												
T 7500299	63.0	42.2	53	46	1	11.9	73.1		120				4			PB	PB								
T 7500330	63.0	40.0	31	66	3	11.9	73.1		90				1			MN	MJ	PB						MJ	
T 7500385	60.5	37.2	13	82	5	12.2	69.7		115				1	PB		MJ	MJ	PB							
T 7500392	60.5	39.5	27	70	3	11.7	71.4		110				1	PB		MN	MJ	PB							
T 7500569	62.5	41.0	43	54	3	13.1	73.1		100				3			MN	MJ	PB							

^{A/} See Table 1 for explanation of abbreviations and symbols.

Table 3

DURUM QUALITY EVALUATION^{A/}

1976 CROP

----- STATE=CALIFORNIA STATION=TULELAKE NURSERY=ADVANCED -----																										
VARIETY	_TW_	_KW_	LG	MD	SM	_PR_	SEEX	SP	DU	_VI_	_FR_	RE_	VAL	_TW_	_KW_	LG	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE_	SD	
LEEDS	61.5	43.1	48	51	1	13.4	68.0		105	8.0	7.82	4.6	4		PB	MN									MN	YS
	63.5	45.8	68	31	1	12.9	66.5		100	8.0	8.23	4.8	4												MN	YS
	60.5	44.1	48	51	1	11.9	66.0		110	8.5	7.32	5.2	3	PB		MN							PB		MN	
	62.0	42.4	40	59	1	12.2	67.0		90	7.0	8.64	5.8	1		PB	MJ					MJ	MN			MN	
	62.0	42.2	40	60	0	13.0	66.5		110	8.5	7.50	5.3	3		PB	MJ									MN	
299	60.0	40.5	27	72	1	12.2	64.5		110	8.5	6.91	5.1	1	PB	MN	MJ			PB						MN	
300	59.5	39.7	38	61	1	12.0	65.0		110	8.0	6.78	4.0	3	MN	MN	MJ			PB						MN	
309	60.5	19.7	66	34	0	12.9	66.0		110	8.5	8.99	5.9	1	PB	MJ										MN	PB
310	61.0	47.4	30	69	1	12.4	67.5		120	9.5	8.06	14.9	1	PB		MJ									MJ	
LEEDS	61.5	43.1	48	51	1	13.4	68.0		105				4		PB	MN										YS
	63.5	45.8	68	31	1	12.9	66.5		100				4													YS
	63.5	44.8	54	45	1	12.2	66.0		100				4													
	62.5	46.3	61	38	1	12.8	65.5		105				4						PB							
	61.5	44.6	48	51	1	12.2	67.5		95				3			MN					MN					
287	60.5	47.1	75	24	1	12.2	65.5		95				3	PB					PB							
289	61.0	20.6	71	29	0	12.7	67.5		100				1	PB		MJ					MN					
293	61.5	41.5	40	59	1	12.8	67.5		105				3		PB	MJ										
294	62.0	45.2	56	43	1	12.2	64.5		95				3						PB		MN					
296	61.5	43.7	46	53	1	12.2	64.5		100				4			MN			PB							
308	60.0	42.0	29	70	1	12.2	67.0		90				1	PB	PB	MJ									MJ	
313	59.5	40.8	18	81	1	12.5	64.5		105				1	MN	MN	MJ			PB							

^{A/} See Table 1 for explanation of abbreviations and symbols.

Table 4

DURUM QUALITY EVALUATION^{A/} 1976 CROP

STATE=CALIFORNIA STATION=TULELAKE NURSERY=ADVANCED																									
VARIETY	_TW_	_KW_	LG	MD	SM	_PR_	SEEX	SP	DU	_VI_	_FR_	RE_	VAL	_TW_	_KW_	LG	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE	_SD
LEEDS MODOC SENTRY 517 519	62.5	38.5	36	60	4	12.9	70.5		110	8.5	6.65	4.7	3		PB	MN							MN	MN	YS
	63.0	44.4	58	40	2	12.7	67.0		105	8.0	7.37	6.6	3						PB				PB	MN	YS
	60.5	36.2	22	73	5	14.1	66.0		90	7.0	8.23	5.2	1	PB	MN	MJ	PB		PB		MJ	MN		MN	
	58.0	37.7	20	76	4	12.3	65.0		110	8.5	6.13	5.6	1	MJ	MN	MJ		MN				MJ	MN		
	62.0	37.9	14	81	5	11.9	66.5		110	9.5	5.25	4.1	1		MN	MJ	PB		PB				MJ	PB	
520 521 531 534	61.5	41.0	21	74	5	11.4	67.0		100	8.5	5.53	3.4	1			MJ	PB		PB		MN		MJ	PB	
	59.0	38.3	18	77	5	12.1	65.0		110	8.5	5.46	5.2	1	MJ	PB	MJ	PB		MN			MJ	MN		
	60.5	46.5	46	51	3	11.8	63.5		110	8.0	7.21	6.3	3	PB				MJ				PB	MN		
	60.0	37.7	11	81	8	12.4	62.5		115	8.0	6.80	5.0	1	MN	MN	MJ	MN		MJ			MN	MN		
	62.5	38.5	36	60	4	12.9	70.5		110				4		PB	MN			PB					YS	
MODOC 513 514 515	63.0	44.4	58	40	2	12.7	67.0		105				4						PB					YS	
	59.5	40.0	29	67	4	12.6	67.5		105				3	MN	PB	MJ									
	60.0	40.2	19	77	4	11.9	67.5		100				1	MN	PB	MJ				MN					
	60.0	44.2	43	54	3	11.2	68.0		90				1	MN						MJ					
	59.5	41.8	28	68	4	11.2	68.5		105				3	MN		MJ					MN				
516 518 522 523 524	59.0	41.7	25	70	5	11.8	65.5		100				1	MJ		MJ	PB		MN						
	58.5	40.0	16	77	7	12.6	65.0		105				1	MJ	PB	MJ	PB		MN						
	62.5	42.7	43	54	3	11.7	64.5		105				3					MN							
	60.5	44.4	32	65	3	13.0	67.5		100				3	PB		MJ				MN					
	60.0	44.2	35	62	3	11.1	64.0		100				2	MN		MN			MJ						
525 526 527 528 529	59.5	42.7	45	52	3	11.8	65.0		95				1	MN					MN		MJ				
	60.0	18.9	70	27	3	12.4	65.0		100				1	MN	MJ				MN		MN				
	60.5	41.3	21	75	4	11.9	63.0		105				1	PB		MJ		MJ							
	61.5	43.5	38	59	3	11.8	67.5		105				4			MN									
	61.5	42.9	36	61	3	12.1	64.5		105				3			MN			MN						
530 532	60.0	46.1	43	54	3	12.8	64.0		105				3	MN					MJ						

^{A/} See Table 1 for explanation of abbreviations and symbols.

Table 5

DURUM QUALITY EVALUATION^{A/}

1976 CROP

----- STATE=CALIFORNIA STATION=TULELAKE NURSERY=ADVANCED -----

VARIETY	_TW_	_KW_	LG	MD	SM	_PR_	SEEX	SP	DU	_VI_	_FR_	RE_	VAL	__TW_	_KW_	_LG_	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE_	SD
LEEDS	61.5	39.8	44	55	1	13.2	68.0		105	8.0	6.83	5.4	3			MN	MN						MN	MN	YS
MODUC	63.0	46.5	64	35	1	13.0	65.0		100	8.5	8.94	5.1	4											MN	YS
SENTRY	61.0	40.3	42	57	1	14.9	66.5		95	7.0	8.64	4.4	3			PB	MN				MN			MN	
2	58.5	38.9	24	73	3	12.5	67.5		110	9.0	8.23	4.5	1	MJ		MN	MJ	PB						MN	
3	59.5	39.2	30	68	2	12.7	57.0		110	9.0	7.37	4.8	1	MN		MN	MJ						PB	MN	
6	62.0	47.6	72	27	1	12.5	67.0		110	8.0	9.27	4.6	4											MN	
11	61.0	45.2	48	51	1	12.7	67.0		110	8.0	8.10	5.0	4			PB								MN	
12	61.5	43.7	53	45	2	12.6	66.5		110	8.0	7.80	3.7	4											PB	
16	60.5	40.8	27	71	2	13.0	67.5		110	8.0	8.08	5.5	1	PB		PB	MJ							MN	
21	59.5	45.7	58	40	2	11.6	65.0		75	5.0	6.72	6.4	1	MN					MJ	MJ			MN	MN	
26	62.0	48.3	72	27	1	12.9	68.5		110	8.0	8.79	5.3	4											MN	
27	62.0	44.4	55	43	2	11.8	68.5		90	6.0	8.08	4.8	1								MJ			MN	
47	61.0	38.6	34	64	2	12.5	68.5		120	9.0	7.19	7.0	3			MN	MJ						PB	MJ	
48	61.5	38.5	11	87	2	12.6	66.5		115	9.0	8.04	5.8	1			MN	MJ							MN	
49	60.5	37.9	10	88	2	12.3	67.0		110	9.5	0.48	62.0	1	PB		MN	MJ						MJ	MJ	
52	62.0	38.2	9	89	2	12.0	67.0		110	9.0	7.69	4.0	1			MN	MJ							PB	
LEEDS	61.5	39.8	44	55	1	13.2	68.0		105				4			MN	MN								YS
MODUC	63.0	46.5	64	35	1	13.0	65.0		100				4												YS
4	62.0	46.5	66	33	1	12.2	66.0		105				4												
7	62.0	42.6	44	54	2	13.1	67.5		100				4			MN									
8	60.0	43.3	35	64	1	12.8	67.0		105				3	PB		MJ									
9	61.0	43.1	26	71	3	13.0	68.0		100				1			MJ	PB								PB
10	59.5	41.3	30	68	2	12.7	67.5		105				1	MN		PB	MJ								
13	60.5	20.1	64	35	1	12.3	67.5		95				1	PB		MJ					MN				
14	59.5	46.9	66	33	1	12.5	69.0		95				3	MN							MN				
17	62.0	44.8	38	61	1	12.7	69.5		100				3			MJ									
18	61.0	45.5	50	48	2	12.7	69.5		95				3												
23	62.5	45.0	53	45	2	12.3	67.5		100				4												
24	60.0	39.1	31	67	2	12.5	68.5		80				1	PB		MN	MJ								
25	62.0	46.7	54	45	1	12.5	67.0		85				1			MJ									
28	60.0	36.0	70	28	2	11.1	68.0		95				3	PB		MJ									
29	60.5	40.5	49	49	2	12.4	65.5		105				4	PB		PB	PB								
30	62.5	47.8	64	35	1	13.1	65.5		95				3												
33	62.5	40.3	29	69	2	12.7	65.0		90				1			PB	MJ				MN				
35	61.0	42.4	40	58	2	13.1	66.0		105				4			MN									
36	60.5	41.0	23	75	2	12.6	67.5		105				1	PB		PB	MJ								
37	61.0	44.4	45	53	2	12.4	67.0		95				3												
38	62.0	48.5	45	54	1	12.6	68.0		105				4			MN									
39	63.0	47.4	70	29	1	13.5	66.0		100				4												
40	61.5	45.0	46	53	1	13.2	67.5		100				4												
46	60.5	46.1	53	45	2	12.1	66.0		105				4	PB											
53	62.5	45.0	47	52	1	12.1	65.0		100				4												
54	61.0	54.3	70	29	1	11.5	69.0		100				4												
55	62.0	54.6	78	21	1	11.5	65.0		105				4												
57	61.0	46.7	40	58	2	11.8	66.5		100				4												
58	62.0	44.2	40	60	0	12.1	65.0		95				3												
59	62.0	45.0	40	59	1	12.0	65.0		95				3												
61	63.0	42.9	49	50	1	12.2	64.5		95				3						PB						
63	60.5	44.4	40	59	1	12.7	55.0		105				4	PB											

A/ See Table 1 for explanation of abbreviations and symbols.

Table 6

DURUM QUALITY EVALUATION^{A/}

1976 CROP

STATE=NORTH_DAKOTA STATION=WILLISTON NURSERY=FIELD-PLOT																										
VARIETY	_TW_	_KW_	LG	MD	SM	_PR_	SEEX	SP	DU	_VI_	_FR_	B/_RE_	B/_VAL	_TW_	_KW_	LG	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE_	SD	
STD-BLEND	61.3	40.3	35	61	4	13.6	53.9	30		9.0	7.1	4.0	4													
BOTND	60.7	33.2	8	90	2	17.6	55.0	10		8.5	6.9	6.4	1													
CANDO	59.4	31.2	2	88	10	17.0	50.7	7		9.0	5.9	6.7	1	PB												
CROSBY	59.4	31.6	4	89	7	17.5	53.8	13		9.5	5.9	6.6	1	PB												
ROLETTE	61.8	37.0	8	91	1	18.0	54.6	13		8.0	6.4	7.0	1													
RUGBY	59.5	32.7	5	91	4	18.2	54.8	17		9.0	6.8	6.7	1	PB												
WAKOOMA	58.9	30.1	1	90	9	18.1	51.8	13		9.5	8.2	6.9	1	PB												
WARD	59.8	34.6	7	89	4	17.8	54.4	17		9.0	7.2	6.2	1	PB												
WELLS	58.8	27.3	1	86	13	17.3	50.5	13		9.0	5.8	7.1	1	PB												
D 7047	60.8	32.8	3	91	6	16.7	51.5	13		9.5	6.8	7.0	1													
D 7175	59.9	35.2	10	85	5	17.2	51.6	17		9.0	6.9	6.8	1													
D 71101	60.5	32.9	5	90	5	17.4	51.6	13		9.0	6.9	6.6	1													
D71104	60.5	34.0	8	88	4	16.8	52.7	17		8.5	6.1	6.7	1													
D 71111	59.5	32.1	4	89	7	17.6	52.2	10		9.0	7.7	6.3	1	PB												
D 71117	58.7	30.1	4	89	7	17.7	52.6	17		9.0	6.3	6.4	1	MN												
D 7224	60.4	33.7	7	87	6	16.0	51.7	7		9.5	6.9	7.8	1													
D 7233	60.4	36.5	11	85	4	17.6	52.6	17		9.5	6.9	6.1	1													
D 7266	60.0	30.9	4	87	9	17.1	52.3	17		9.5	7.9	6.9	1													
D 7270	59.2	28.5	2	85	13	17.5	51.6	10		9.0	6.8	7.3	1	PB												
D 7275	61.1	37.3	17	82	1	17.1	49.8	10		9.5	6.8	7.1	3													
D 7298	60.1	33.0	12	84	4	17.7	50.5	10		9.0	7.4	7.1	1													
D 72114	59.8	32.7	22	77	1	17.6	50.3	13		8.5	6.6	7.2	3	PB												
D 74107	60.5	34.8	8	90	2	17.6	53.1	13		9.5	8.3	6.8	1													
D 74110	60.4	34.7	7	89	4	17.6	51.0	10		9.0	6.2	7.0	1													
D 74111	60.0	35.1	5	91	4	17.7	52.5	13		9.0	7.6	7.1	1													
D 74112	60.4	34.7	13	85	2	17.6	52.4	23		9.5	7.2	7.0	1													
D 74114	60.7	33.1	8	88	4	17.8	53.2	17		9.0	7.8	6.6	1													
D 74116	60.2	32.6	6	88	6	18.0	52.6	20		9.0	7.9	7.2	1													
DT 411	59.1	31.7	4	89	7	17.5	51.9	10		9.5	8.6	6.5	1	PB												

A/ See Table 1 for explanation of abbreviations and symbols.

B/ For a cooking time of 15 min.

Table 7

DURUM QUALITY EVALUATION^{A/} 1976 CROP

----- STATE=NORTH_DAKOTA STATION=DICKINSON NURSERY=FIELD-PLOT -----																									
VARIETY	_TW_	_KW_	LG	MD	SM	_PR_	SEEX	SP	DU	_VI_	_FR_	RE ^{B/}	VAL	--TW_	_KW_	LG	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE_	SD
STD-BLEND	61.3	40.3	35	61	4	13.6	53.9	30		9.0	7.1	4.0	4												YS
	61.2	35.7	15	82	3	17.0	51.8	10		9.5	7.2	6.0	3		MN	MJ			PB	MN					MN
	60.7	32.3	6	89	5	15.9	51.6	10		9.5	7.4	6.5	1		MJ	MJ			MN	MN					MN
	60.2	35.1	13	84	3	17.0	51.5	7		9.5	7.9	5.6	1		MN	MJ			MN	MN					PB
	61.9	38.5	17	78	5	16.1	50.2	20		9.0	5.6	7.8	3		PB	MJ			MJ	MJ		PB			MN
RUGBY	60.7	35.3	20	78	2	17.0	51.6	10		9.5	7.7	6.5	3		MN	MJ			MN	MN					MN
	60.1	35.1	11	86	3	16.9	50.1	10		9.5	8.5	5.7	1		MN	MJ			MJ	MJ					PB
	60.0	36.4	18	80	2	17.7	49.3	10		9.5	8.4	6.3	3		MN	MJ			MJ	MJ					MN
	59.7	32.2	13	82	5	17.6	50.0	13		9.0	7.5	6.0	1	PB	MJ	MJ			MJ	MJ					MN
D 7047	61.6	36.9	11	85	4	14.3	52.1	10		9.5	5.8	6.4	1		MN	MJ			PB	MJ		PB			MN
D 7175	60.8	40.5	20	78	2	16.7	51.2	10		10.0	7.1	6.1	3			MJ			MN	MN					MN
	60.8	34.7	10	87	3	17.1	53.0	7		9.0	7.5	5.7	1		MN	MJ									PB
	61.0	36.8	16	81	3	14.6	52.7	7		9.0	4.7	7.3	3		MN	MJ						MJ			MN
	59.5	37.2	16	80	4	15.8	51.8	10		9.0	6.3	6.5	3	PB	MN	MJ			PB						MN
	60.8	41.7	24	75	1	16.0	53.8	13		9.0	6.6	6.5	4			MN									MN
D 7233	60.9	37.3	19	79	2	16.8	52.6	10		9.5	6.6	6.3	3		PB	MJ									MN
	60.8	39.1	17	80	3	17.2	55.2	17		9.5	7.0	7.0	3		PB	MJ									MN
	61.8	44.2	44	55	1	17.9	51.5	20		9.0	6.5	7.2	4						MN	MN					MN
	59.9	42.0	56	43	1	17.3	51.0	23		9.0	6.3	6.6	4						MN	MN					MN
	60.2	40.2	18	80	2	17.8	52.8	23		9.0	6.9	6.9	3			MJ									MN
D 74110	60.7	39.3	18	79	3	17.4	52.4	27		9.0	6.7	7.1	3		PB	MJ			PB						MN
	61.0	37.5	9	88	3	17.4	53.9	17		9.5	8.2	7.1	1		PB	MJ									MN
	61.1	40.8	20	79	1	17.0	52.4	30		9.0	6.5	7.1	3			MJ			PB	MN					MN
	61.3	39.1	19	78	3	17.5	55.3	17		9.0	7.0	6.9	3		PB	MJ									MN
	60.3	35.3	7	90	3	17.9	51.3	17		9.5	6.0	6.6	1		MN	MJ			MN						MN
D 74116	60.0	34.0	14	83	3	17.3	50.6	7		9.5	7.3	5.7	1		MN	MJ			MN						PB

A/ See Table 1 for explanation of abbreviations and symbols.

B/ For a cooking time of 15 min.

Table 8

DURUM QUALITY EVALUATION^{A/}

1976 CROP

STATE=CALIFORNIA STATION=EL-CENTRO NURSERY=FIELD-PLOT																									
VARIETY	_TW_	_KW_	_LG_	MD	SM	_PR_	SEEX	SP	DU	_VI_	_FR_	_RE_	_VAL_	_T#_	_KW_	_LG_	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE_	_SD_
LEEDS	63.9	41.2	43	56	1	14.2	53.9	43	130	9.0	7.91	2.6	1		MN	MJ				MJ					YS
MEXICALI 75	63.1	53.2	75	23	2	11.3	57.2	30	125	8.5	7.02	4.9	3							MN			PB		YS
MODOC	65.1	45.5	66	33	1	12.4	54.1	30	125	8.5	7.56	5.6	4		PB					MN					YS
COCORIT 71	62.2	46.9	54	43	3	11.5	55.6	43	85	5.0	7.84	7.7	1	PB		PB	PB			MJ	MJ	MJ		MJ	YS
CRANE 'S'	61.1	47.8	53	45	2	11.8	55.8	37	95	6.0	8.01	6.5	1	MN		MN				MJ	MJ	MJ			MN
JORI 69	62.8	56.2	73	24	3	13.5	52.7	23	100	7.5	7.11	3.9	1				PB		MN		MJ	MN	PB		PB
PRODURA	63.5	47.6	66	32	2	12.4	57.7	27	95	7.5	6.78	5.9	1								MJ	MN	MN		MN
ND 6655	63.9	44.4	42	56	2	11.2	56.1	30	130	9.0	6.13	4.7	3		PB	MJ				MN			MJ		MN
66049	62.9	47.1	44	54	2	11.9	55.0	27	115	8.0	6.91	4.9	1			MJ					MJ	PB	MN		MN
68044-110	65.5	42.0	47	51	2	11.3	54.8	30	130	9.0	6.76	4.4	3		MN	MJ				MN			MN		MN
68044-27D	62.5	44.2	42	56	2	12.4	56.0	43	140	9.5	6.96	4.7	1	PB		PB	MJ			MJ			MN		MN
68047	64.4	50.8	63	35	2	12.2	56.6	20	140	9.5	8.34	4.2	4												PB
68058	62.6	38.3	9	85	6	12.6	56.6	37	145	9.5	7.13	4.1	1		MJ	MJ	MN			MJ			PB		PB
69482	64.2	62.9	84	15	1	11.1	56.9	27	115	8.0	7.32	5.7	1								MJ	PB	PB		MN
69483-110	64.2	39.5	34	64	2	12.4	56.2	30	145	9.5	7.00	4.9	1		MN	MJ				MN			PB		MN
69483-43D	64.3	48.8	57	41	2	12.4	55.9	23	125	9.0	7.02	5.1	4			PB							PB		MN
69484	64.0	44.2	47	51	2	12.4	55.2	27	140	9.5	8.16	3.0	3		PB	MJ									
69486	63.7	45.0	49	49	2	11.7	55.4	37	125	9.0	6.35	5.1	3		PB	MN				MJ			MJ		MN
69487	63.8	43.7	34	64	2	11.5	55.5	23	125	8.5	6.59	4.2	1		PB	MJ							MN		PB

^{A/} See Table 1 for explanation of abbreviations and symbols.

Table 9 DURUM QUALITY EVALUATION^{A/}

1976 CROP

----- STATE=WASHINGTON STATION=ROYAL_SLOPE NURSERY=INTERNATIONAL -----																									
VARIETY	_TW_	_KW_	LG	MD	SM	_PR_	SEEX	SP	DU	_VI_	_FR_	_RE_	VAL	_TW_	_KW_	_LG_	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE_	SD
STD BLEND-76	61.3	40.3	35	61	4	13.6	70.6		110	8.5	6.97	5.2	3												
WARD	62.5	46.7	65	34	1	13.4	72.0		110	9.0	6.85	3.5	3												
GAVIOTA D-3172S	60.0	41.5	38	59	3	11.4	71.4		90	7.0	8.88	4.2	1												
GTAX 21563	62.5	54.6	68	30	2	10.6	72.0		85	5.0	6.42	4.1	1												
HERCULES-GTA	60.5	50.0	72	27	1	11.4	71.4		90	7.5	6.70	4.6	1												
MEXICALI ^S CM	60.0	53.2	77	21	2	11.5	72.0		100	8.0	8.27	4.1	3												
RABI-FG	62.0	51.3	66	33	1	11.9	69.1		85	7.0	8.38	5.8	1												
S15-CRANE	60.5	46.3	45	52	3	11.3	68.0		90	7.0	8.62	4.4	1						PB						
SNIPE CM	60.5	44.8	50	48	2	11.2	67.4		90	7.0	7.73	4.2	1						MN						
VALGERARDO VZ 512	62.0	19.4	66	33	1	12.5	70.9		90	8.0	7.91	4.2	1												

^{A/} See Table 1 for explanation of abbreviations and symbols.

Table 10

DURUM QUALITY EVALUATION^{A/}

1976 CROP

----- STATE=MN-MT-ND-SD STATION=BLEND NURSERY=UNI FORM -----																										
VARIETY	_TW_	_KW_	_LG_	_MD_	_SM_	_PR_	_SEEX_	SP	DU	_VI_	_FR_	_RE_	_VAL_	_TW_	_KW_	_LG_	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE_	SD	
STD BLEND-76	61.3	40.3	35	61	4	13.6	70.6		110	8.5	6.97	5.2	3													
	61.7	40.4	27	69	4	14.6	68.0		115	9.0	7.41	4.0	3			PB			PB				MN	MN	YS	
	61.9	38.5	18	78	4	13.8	65.3		120	9.5	7.88	4.1	3		PB				MJ				PE	PB	PB	
	61.5	40.8	22	74	4	14.6	67.2		115	9.5	7.82	4.1	3			MN			MN					PB	PB	
	61.9	41.1	25	71	4	14.5	66.4		105	8.5	8.25	4.8	3			MN			MN		PB				MN	
ROLETTE	62.6	42.7	24	73	3	15.1	66.5		115	9.5	6.83	4.4	3			MN			MN						MN	MN
RUGBY	61.6	41.3	26	70	4	14.6	66.0		120	9.5	7.67	4.4	3			MN			MN						MN	MN
WAKOOMA	60.9	40.5	22	75	3	15.1	65.0		120	9.0	9.09	2.9	3			MN			MJ							MN
WARD	62.1	41.5	25	71	4	14.7	66.0		115	9.0	7.32	4.5	3			MN			MN				PB		MN	MN
WELLS	62.4	36.9	14	80	6	14.5	65.2		120	9.5	7.84	4.5	1		MN	MJ	PB		MJ						MN	MN
D 7047	62.5	40.7	24	73	3	14.1	67.5		125	9.5	8.81	4.9	3			MN			MN							MN
D 7175	61.7	42.7	32	66	2	14.8	66.4		130	9.5	9.98	4.0	3			MN			MN							PB
D 71101	62.1	41.1	23	74	3	14.8	66.9		120	9.5	7.86	4.6	3			MN			MN							MN
D 71104	62.1	42.2	29	68	3	14.6	66.2		120	9.5	7.82	4.7	3			PB			MN							MN
D 71111	62.1	40.9	28	68	4	14.6	66.4		120	9.5	8.06	2.6	3			PB			MN							MN
D 71117	61.4	41.8	30	67	3	14.4	66.8		125	9.5	7.91	0.5	3			PB			MN							
D 7224	62.1	44.9	42	56	2	13.2	65.3		130	9.5	8.73	3.5	3						MJ							PB
D 7233	61.9	41.4	38	58	4	14.8	66.6		120	9.0	8.14	4.4	3						MN							MN
D 7266	62.1	41.8	28	68	4	14.1	66.7		125	9.0	6.85	4.5	3			PB			MN				MN			MN
D 7270	61.7	40.1	23	73	4	13.9	65.5		125	9.5	6.74	5.4	2			MN			MJ							MN
D 7275	62.4	43.7	42	55	3	15.6	65.4		125	10.0	6.80	4.4	2						MJ							MN
D 7298	6.2	41.7	35	62	3	14.7	66.0		130	10.0	7.54	4.1	1		MJ				MN							MN
D 72114	61.8	43.7	56	42	2	14.7	64.0		125	9.5	7.73	3.6	3						MJ							PB
D 74107	61.5	42.5	31	66	3	15.6	63.3		120	9.0	9.96	4.7	3						MJ							MN
D 74110	61.8	42.9	31	66	3	15.3	62.1		130	9.5	9.20	2.1	3						MJ							
D 74111	61.7	42.1	24	73	3	15.3	64.7		125	9.5	7.13	3.6	3			MN			MJ				PB			PB
D 74112	62.5	45.1	36	63	1	15.4	65.2		130	10.0	8.34	4.3	3						MJ							MN
D 74114	62.7	4.4	37	60	3	15.0	65.9		130	10.0	9.78	4.8	1		MJ				MJ							MN
D 74116	62.3	42.4	26	71	3	15.2	64.5		135	10.0	5.25	3.9	2			MN			MJ							PB
DT 354	61.7	43.2	40	57	3	14.3	66.9		130	10.5	3.87	5.7	2						MJ				MJ			PB
DT 411	61.1	41.3	31	65	4	14.3	66.2		125	10.5	4.34	4.2	2						MN				MJ			PB

^{A/} See Table 1 for explanation of abbreviations and symbols.

Table 11

DURUM QUALITY EVALUATION ^{A/}

1976 CROP

STATE=WASHINGTON STATION=ROYAL_SLOPE NURSERY=UNIFORM																									
VARIETY	_TW_	_KW_	LG	MD	SM	_PR_	SEEX	SP	DU	_VI_	_FR_	_RE_	VAL	_TW_	_KW_	_LG_	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE_	SD
CANDO MODOC WANDELL CA 304	62.5	43.1	34	63	3	11.6	71.4		105	9.0	7.28	2.6	4												YS
	64.0	45.8	63	36	1	13.4	70.3		100	8.0	9.53		3												YS
	61.0	35.8	5	84	11	11.5	70.3		105	9.5	7.00	4.6	1	PB	MN	MJ	MN					PB	PB		MN
	64.5	47.4	52	47	1	12.8	71.4		115	9.5	7.56	4.2	4												PB
WA 6282 WA 6283 WA 6291 WA 6292	62.0	48.5	54	43	3	12.1	73.7		115	9.0	8.53	3.6	4												PB
	62.0	47.8	61	37	2	12.2	71.4		115	9.5	7.80	6.1	4												MN
	60.0	40.3	43	55	2	11.4	70.9		105	8.5	7.99	4.8	4	PB											MN
	60.5	42.7	35	63	2	11.8	72.0		110	8.5	8.36	4.8	4	PB											MN
CANDO MODOC WANDELL CA 303 CA 306	62.5	43.1	34	63	3	11.6	71.4		105				4												YS
	64.0	45.8	63	36	1	13.4	70.3		100				3								PB				YS
	61.0	35.8	5	84	11	11.5	70.3		105				1	PB	MN	MJ	MN								YS
	64.0	50.0	67	32	1	13.0	70.3		110				4												
CH 725034 CH 725056 CH 725169 WA 6183 WA 6281	64.0	48.1	67	32	1	12.4	72.0		110				4												
	62.0	46.7	54	43	3	12.2	73.7		115				4												
	62.0	44.6	54	43	3	12.0	72.0		115				4												
	63.0	46.5	59	38	3	12.3	71.4		110				4												
WA 6286 WA 6287 WA 6290 T 7500361 T 7500365	63.0	44.2	49	48	3	12.2	74.9		100				3												
	63.0	51.3	67	32	1	12.4	72.6		115				4												PB
	61.0	47.4	61	38	1	11.9	73.7		115				4	PB											
	61.0	49.5	61	38	1	11.7	70.9		110				4	PB											
71150125 71150150	61.5	45.2	57	41	2	12.1	71.4		115				4												
	63.0	38.6	38	59	3	12.7	73.1		105				4												
	63.0	46.1	65	34	1	13.6	74.3		110				4												
	62.0	46.3	55	42	3	11.9	72.6		110				4												
	62.0	47.8	52	45	3	12.4	74.3		115				4												

^{A/} See Table 1 for explanation of abbreviations and symbols.

STATE=CALIFORNIA STATION=TULELAKE NURSERY=UNIFORM

VARIETY	_TW_	_KW_	_LG_	_MD_	_SM_	_PR_	_SEEX_	_SP_	_DU_	_VI_	_FR_	_RE_	_VAL_	_TW_	_KW_	_LG_	_SM_	_PR_	_MG_	_SP_	_DU_	_VI_	_FR_	_RE_	_SD_
CANDO	60.0	32.7	6	91	3	11.6	62.5		110	8.5	7.56	4.0	4		MN	MN								PB	YS
MEXICALI-75	59.5	48.5	40	58	2	12.3	62.5		105	8.5	7.39	4.7	4										PB	MN	YS
MODOC	63.5	44.6	30	69	1	13.0	59.0		110	9.0	8.83	9.6	3											MJ	YS
WANDELL	55.5	28.9	1	87	12	12.0	57.5		105	9.5	6.87	3.6	3	MJ	MJ	MJ			MN				MN	PB	YS
COCORIT-71	58.0	39.2	17	80	3	11.4	61.5		85	7.0	6.96	6.7	1	PB							MJ	MJ	MN	MN	
CRANE-B	56.0	36.8	14	83	3	12.2	58.0		90	7.0	6.72	8.0	1	MJ	PB	PB			PB			MJ	MJ	MN	MJ
PRODURA	60.5	42.4	24	75	1	12.7	57.5		90	7.0	5.57	9.0	1						MN		MJ	MJ	MJ	MJ	MJ
WA 6282 1410	59.0	39.5	21	77	2	11.9	60.5		115	9.0	6.85	6.4	3											MN	MN
WA 6283 1411	58.5	41.8	22	76	2	11.8	60.5		115	8.5	7.06	7.4	3											PB	MJ
WA 6284 1412	58.0	40.5	22	76	2	11.8	59.5		120	9.0	6.52	1.2	3	PB									MN		
WA 6291 1419	53.0	31.8	10	83	7	12.3	57.5		115	9.0	7.11	9.9	1	MJ	MJ	MN	PB		MN				PB	MJ	
WA 6292 1420	57.0	33.6	12	82	6	12.2	58.5		115	9.0	6.93	7.3	3	MN	MN	PB	PB		PB				MN	MJ	
ID 000086 1405	55.0	30.0	1	85	14	12.1	56.0		110	9.5	6.46	5.1	2	MJ	MJ	MJ	MJ		MJ				MJ	MN	
CANDO	60.0	32.7	6	91	3	11.6	62.5		110				4		MN	MN									YS
MEXICALI-75	59.5	48.5	40	58	2	12.3	62.5		105				4												YS
MODOC	63.5	44.6	30	69	1	13.0	59.0		110				4												YS
WANDELL	55.5	28.9	1	87	12	12.0	57.5		105				3	MJ	MJ	MJ			MN						YS
WA 6289 1417	57.5	41.3	22	75	3	12.1	59.5		115				4	PB											
1399	61.5	42.0	21	77	2	13.3	58.0		115				4						PB						
1400	62.5	40.0	18	80	2	13.0	61.0		120				4												
1401	62.0	41.2	27	72	1	13.1	61.5		120				4												
WA 6278 1406	62.5	42.7	23	75	2	12.9	63.0		115				4												
WA 6279 1407	62.5	43.5	28	71	1	13.7	64.0		115				4												
WA 6280 1408	59.0	38.2	11	86	3	11.9	60.0		115				4			MN									
WA 6281 1409	58.5	40.5	22	76	2	11.8	59.0		120				4												
WA 6285 1413	59.0	41.8	22	76	2	11.8	61.0		115				4												
1414	58.0	40.2	18	80	2	12.0	60.5		115				4							PB					
1415	58.0	41.3	21	74	5	11.7	59.5		120				4							PB					
WA 6288 1416	58.0	39.5	18	76	6	11.8	57.5		120				3	PB			PB		MN						
WA 6290 1418	58.0	40.2	35	62	3	11.7	60.0		110				4							PB					
WA 6293 1421	62.0	43.3	50	48	2	14.1	63.0		120				4												
WA 6294 1422	62.0	44.2	48	50	2	13.8	63.5		115				4												
WA 6295 1423	62.5	43.3	54	45	1	13.9	64.5		120				4												
TL 75393 1424	62.5	46.7	59	39	2	11.7	59.0		120				4												
TL 75394 1428	62.0	39.2	10	86	4	12.9	60.0		120				4										MN		
TL 75395 1426	58.5	38.0	9	87	4	12.6	61.0		120				4										MN		
TL 75396 1425	60.0	40.7	33	64	3	11.9	61.0		120				4												
TL 75397 1427	60.5	38.5	10	86	4	12.9	60.0		120				4										MN		
TL 75408 1429	58.5	38.6	14	84	2	12.9	59.5		125				4										PB		
TL 75409 1430	59.0	36.9	10	80	10	12.3	59.5		115				4										PB	MN	MN

A/ See Table 1 for explanation of abbreviations and symbols.

